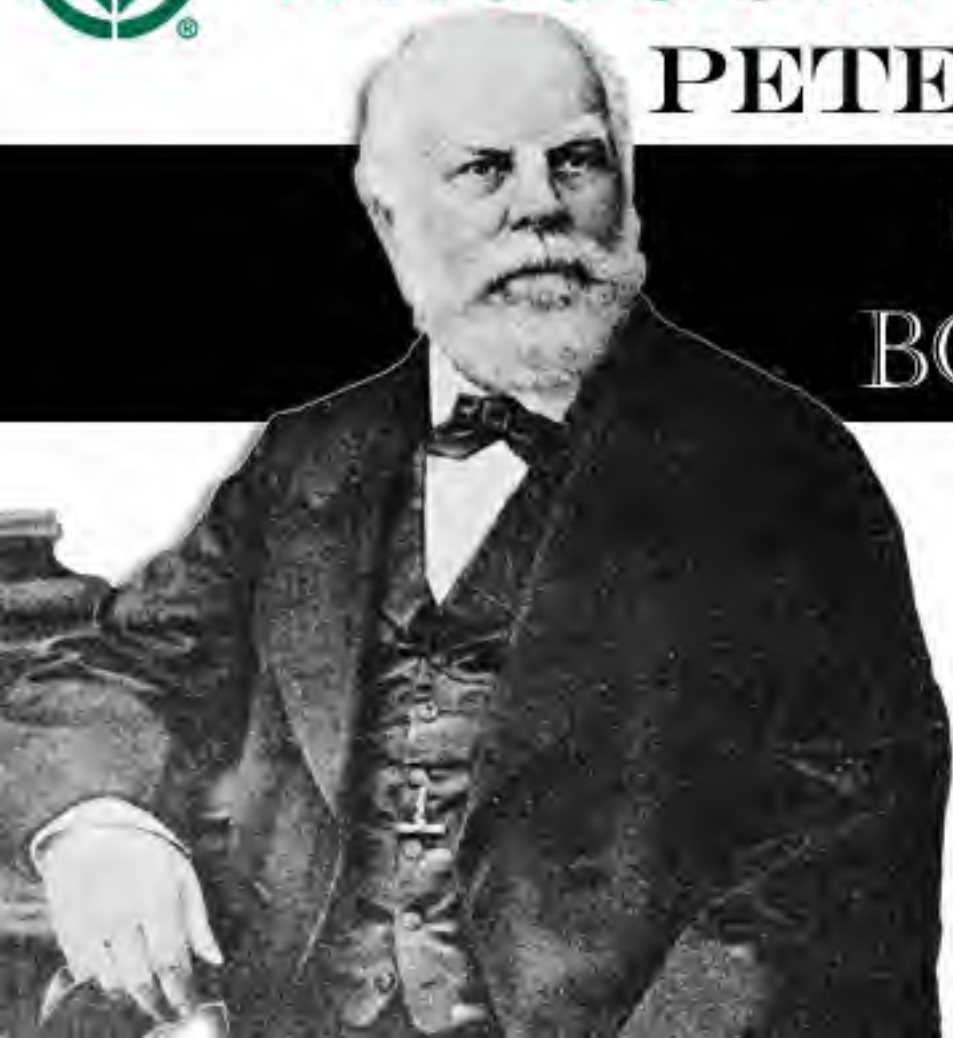


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GEORGE ENGELMANN
BOTANICAL NOTEBOOKS

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identical with, *P. acuta*, Hall. It has the same form and arrangement of the cells, with the exception of the cells being as large on the outside as on the middle rows. It differs, moreover, in the edges of the branches not being acute but rounded, but above all by the existence of a central lammella or plate which separates the opposite and less flattened portions of the bryozoom.

Geol. Pos. & Loc.—Upper Silurian, Columbus, Ohio.—
[Illinois State Collection.]

49-54
P. Tuckermani A. Braun
in Litt

macrospores

Myster River	0.46 - 0.52
— Pond	0.47 - 0.56
Horn Pond	0.50 - 0.58
Tuckerm	0.64 - 0.50
Myster River	0.48 - 0.61

microspores

Myster River	0.024 - 29
— Pond	0.029 - 32
Horn Pond	0.029 - 32



0 1 2 3 4 5 6 7 8 9 10

cm

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city.

TEMPERATURE.

13617

YEAR.	JAN.	FEB.	MAR.	APRIL	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.	MEAN OF YEAR.
1861...	32.2	40.4	44.8	58.1	64.1	76.9	77.5	78.6	69.1	57.9	46.0	39.7	57.1
1862...	28.9	30.2	43.2	55.0	69.7	75.1	81.2	80.7	72.1	57.3	42.6	41.3	56.4
1863...	36.8	35.7	43.6	57.4	65.5	71.9	77.2	77.5	69.2	48.0	43.7	35.9	55.2
1864...	29.2	38.3	40.7	51.4	69.4	78.9	83.5	78.8	72.9	53.1	44.9	30.4	56.0
1865...	28.1	38.4	46.7	56.8	68.8	80.7	77.7	78.1	77.8	58.8	48.0	30.8	57.5
Mean	31.0	36.6	43.8	55.7	67.5	76.7	79.4	78.7	72.2	57.0	45.0	35.6	56.4

RELATIVE HUMIDITY.

1861...	72.2	63.3	64.5	61.5	66.3	70.8	66.3	69.6	77.3	76.6	69.0	74.3	69.5
1862...	85.3	73.9	70.8	67.0	57.3	67.0	66.8	64.3	74.2	67.2	69.5	74.6	69.8
1863...	79.2	81.7	68.1	57.2	59.4	67.7	68.6	70.7	68.2	74.4	67.4	79.5	70.2
1864...	75.6	62.7	70.0	69.8	56.4	61.5	62.8	69.0	64.1	67.9	74.2	75.5	67.4
1865...	74.6	72.0	66.1	66.8	62.1	67.9	77.4	71.7	76.8	74.1	62.3	78.8	70.9
Mean	77.4	70.7	67.9	64.5	60.3	67.0	68.4	69.1	72.1	72.0	68.5	76.5	69.6

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Isotria Tuckeri Br. Dec 11 1866

original specimen

Tucker in Hb. A. Gray

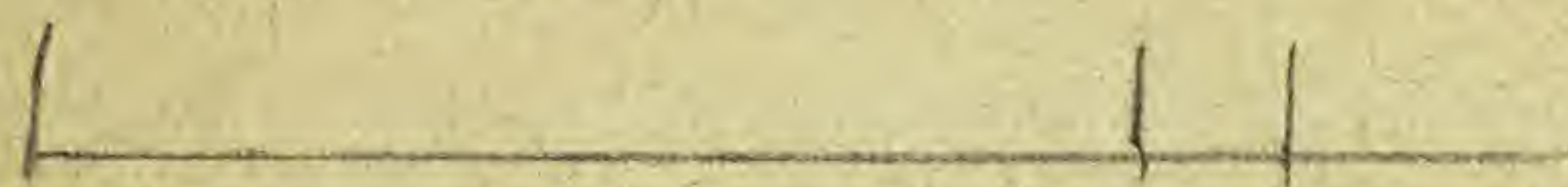
" in the Myster, near the Pond.

Medford " Aug 1848 "

about 30 leaves, 2-2½
inches long, venation
very slender

Sub nom. "*I. riparia* Engelm."

x60



Spores very perfect

Diameter 0.44-0.50 mm

absolutely my plant
of 1866



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Isoetes Tuckermanni

is a smaller more slender plant than
I. Braunii, with fewer leaves, grows in
shallow water and more gregarious
sometimes carpeting the bottom with its
olive green leaves, like a grassy turf.
The lowest tide (at the low end of
Mystic Pond) leaves it yet a few
inches below the surface. In Horn Pond
there is, of course, no tide.
Wm Booth in litt Nov 3^d 1866.



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Isotria Medusina

Oct 28 1866

Wm Booth, Myrtle Pond Oct 21 66

cells of microsporangium X280

all pale



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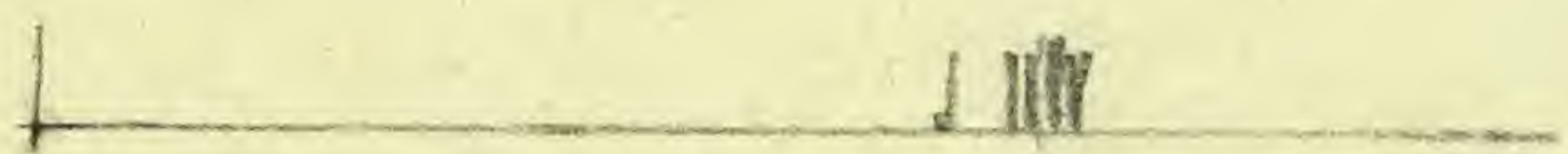
Isotria Tuckermanni

Nov 22 1867

Wm. Booth North side of Mystic Pond, Aug 9 1867

not quite ripe

marking of macrospores
delicate



$$\frac{24 - 27.5}{60}$$

$$= 0.40 - 0.46 \text{ min}$$

x2



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MANUSCRIPTS DEPARTMENT
MISSOURI BOTANICAL GARDEN

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Isoetes Tuckermanni

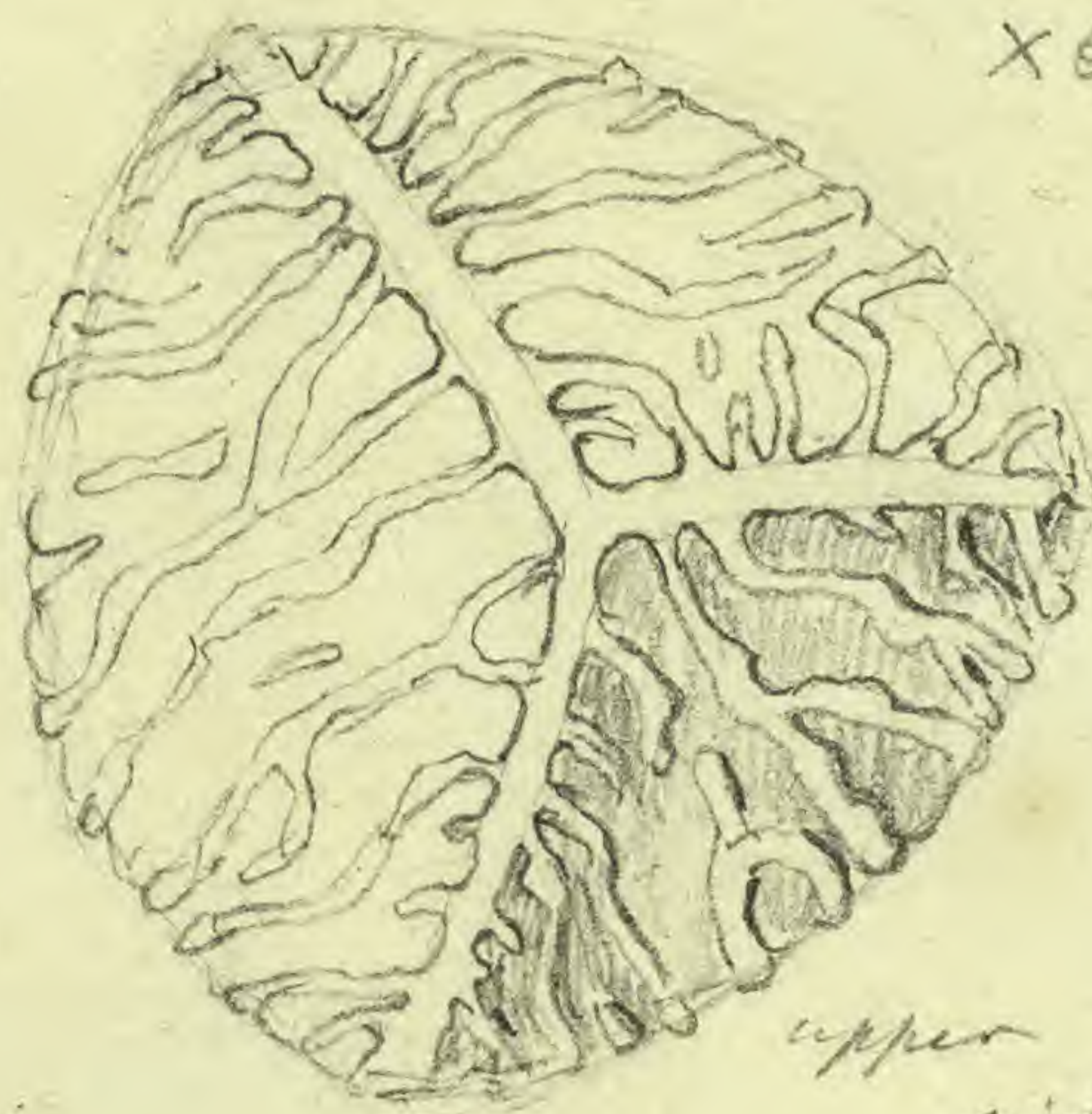
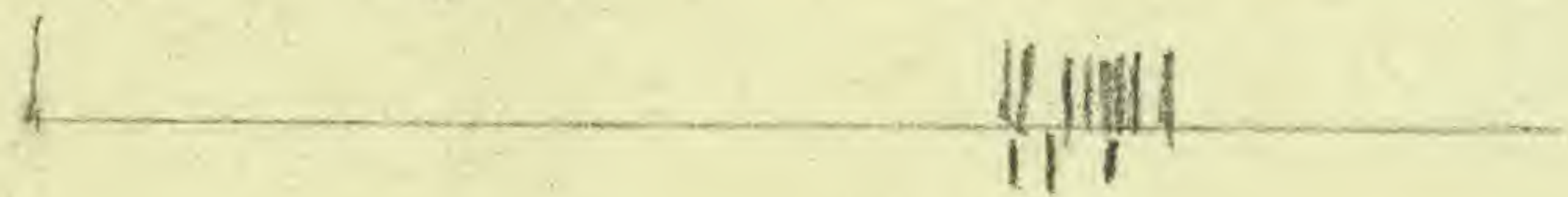
Nov 4 1866

Horn Pond, lower end, station N. 8

W. Booth Oct 29 1866

Diameter of Spores

$$\frac{30-35}{60} = 0.50 - 0.58 \text{ mm}$$



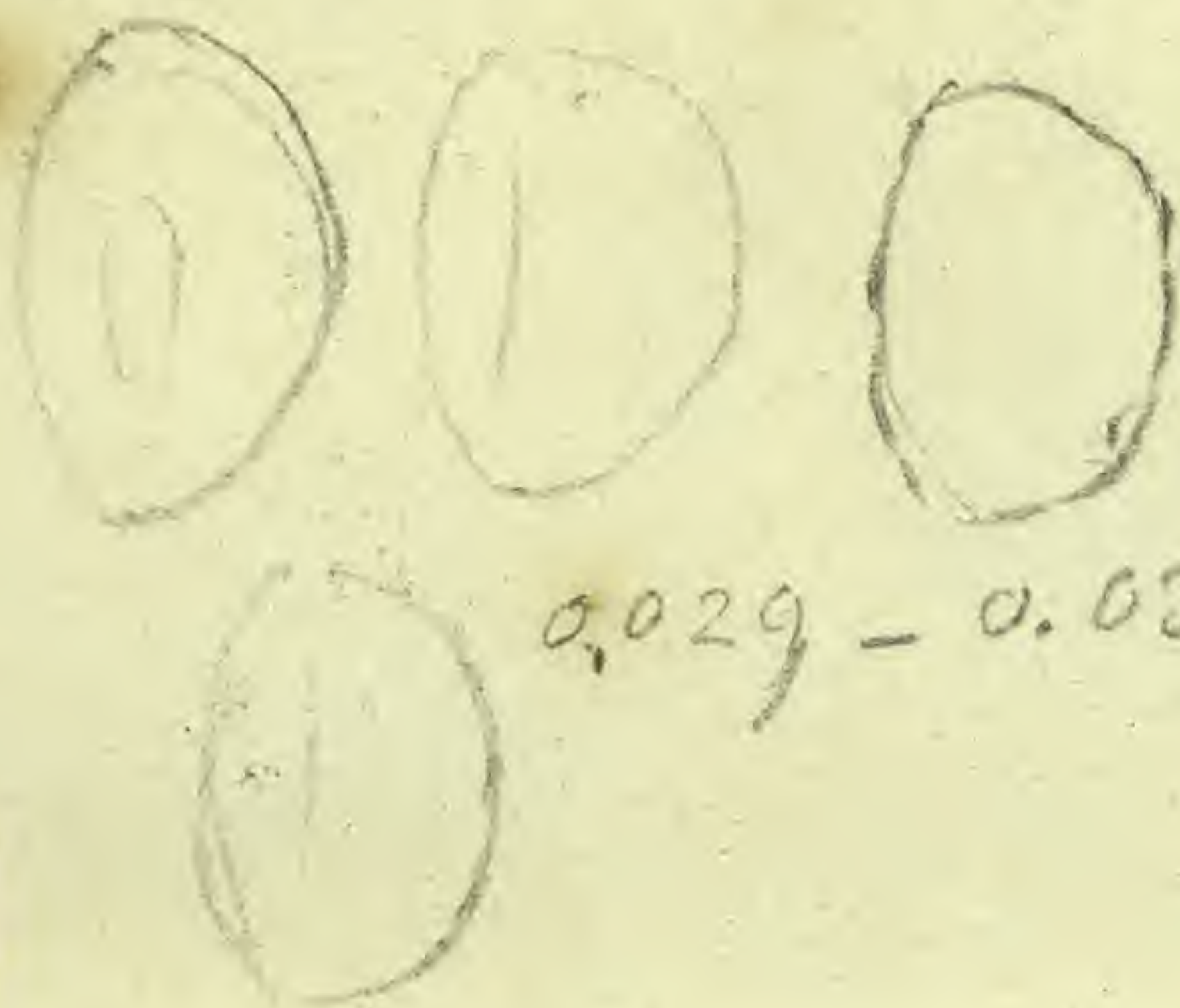
x60



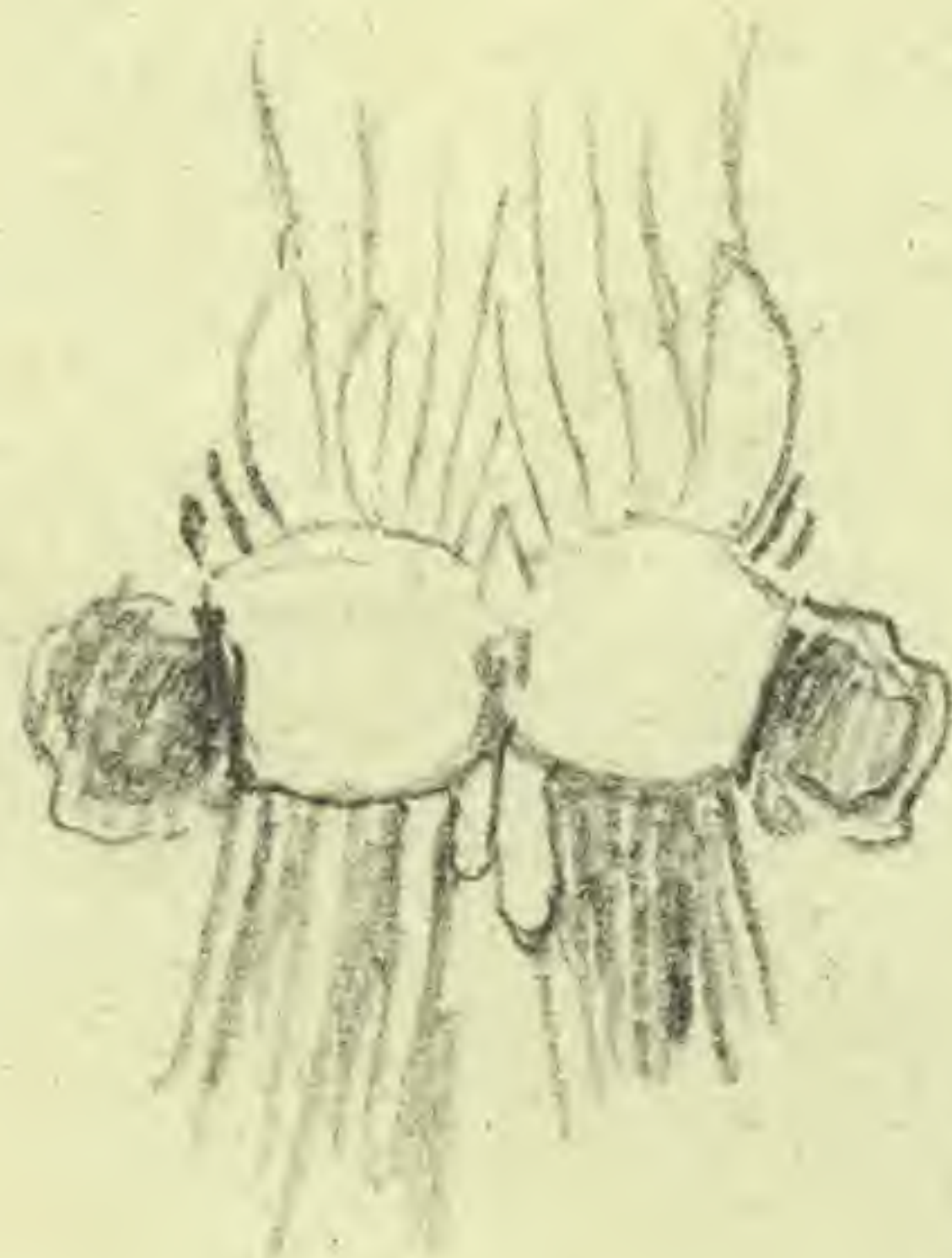
upper side

lower

x415



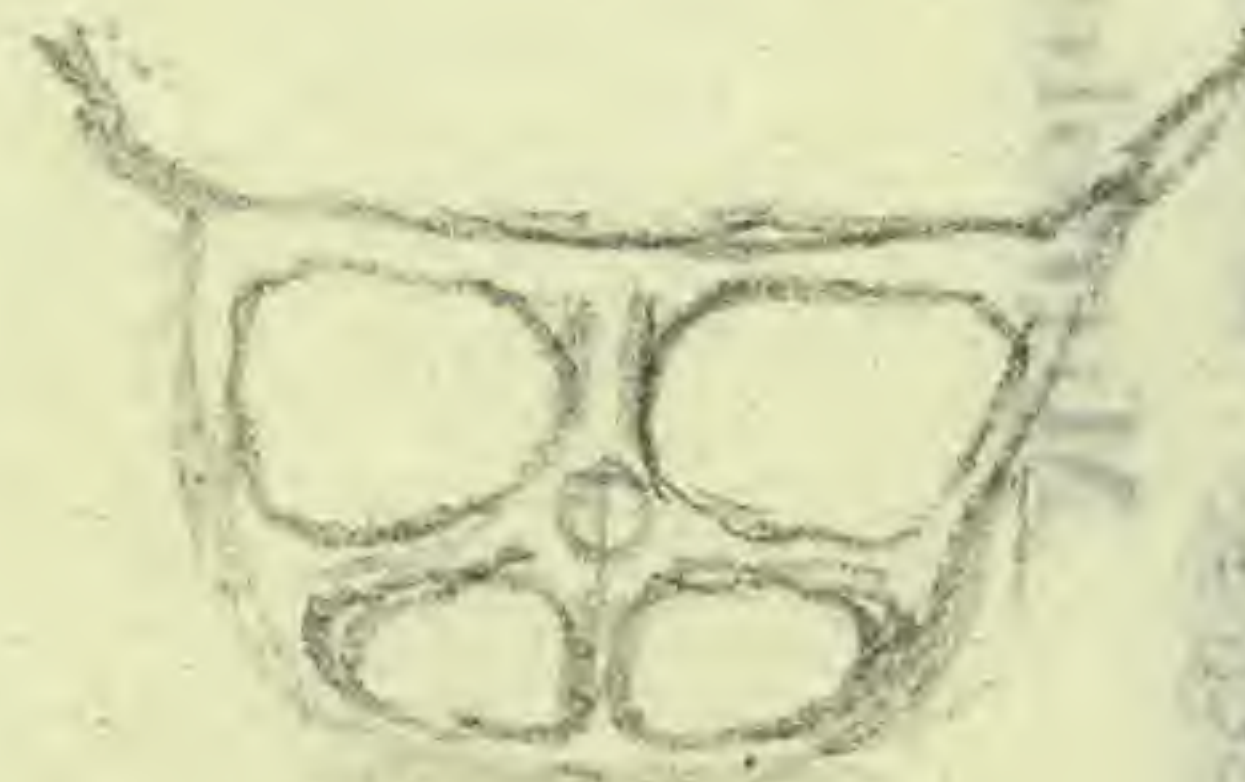
0.029 - 0.032



x2



sub of leaf x10



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J. Tuckermani

Nov 21 '67

W - Proctor

Spring pond

Sept 5 1867

north side



lower hemisphere

R - 20 leaves
5-7 cm long
recurve



$$\frac{26.8 - 34.2}{60} = 0.44 - 0.57 \text{ mm}$$



$$\frac{11-13}{415} = 0.027 - 0.031 \text{ mm}$$



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Tuckermanni
maxima

Nov 21 1867

Wm Booth East side of Spy pond Sept 9 67

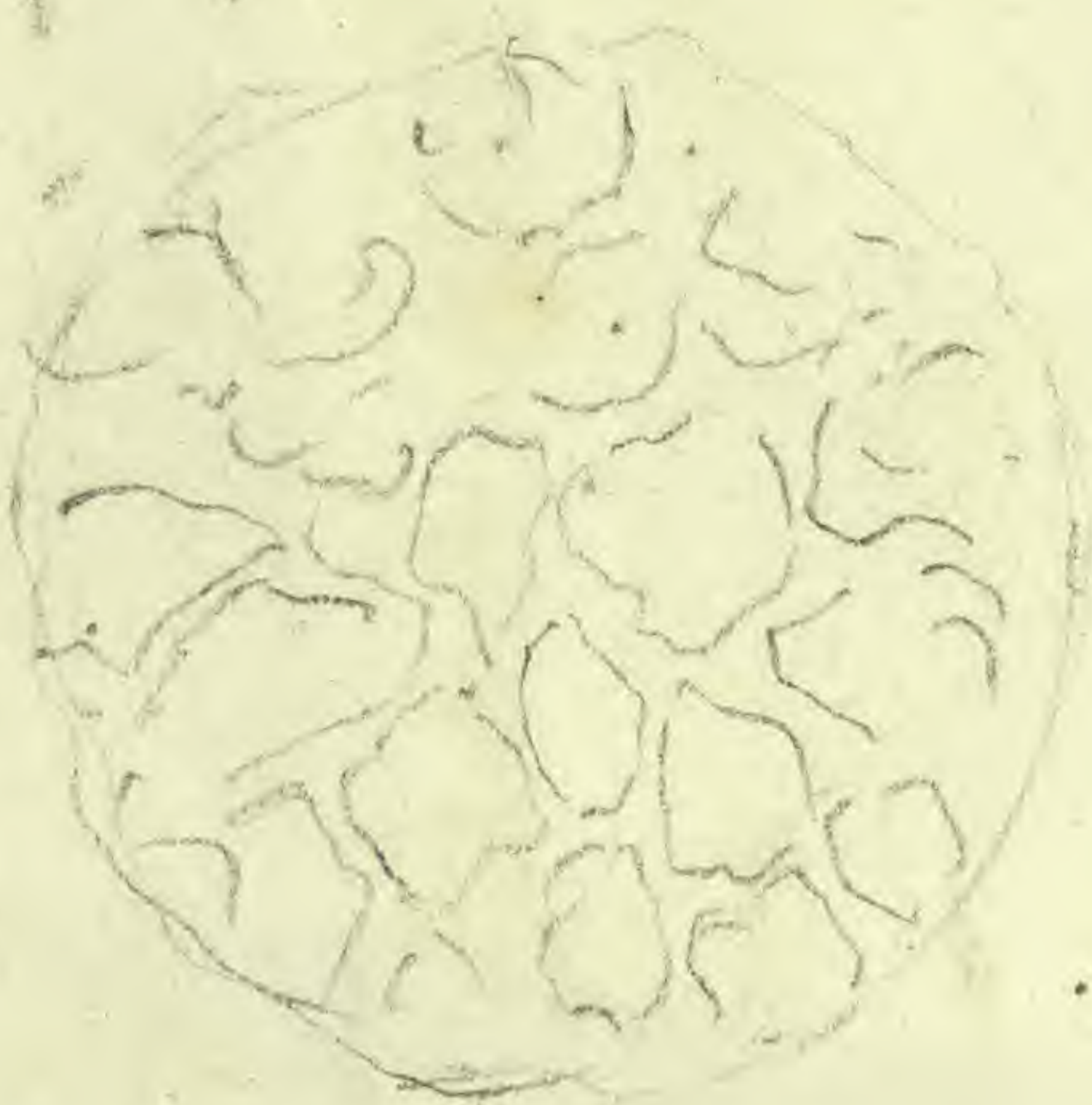
30-40 leaves



$$\frac{11-13}{245} = 0.024 - 0.031 \text{ mm}$$



$$\frac{28.5 - 34.5 \text{ mostly } 32}{60} = 0.47 - 0.57 \text{ mm}$$



lower side
almost regular
reticulate.



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ALL THE NEW REMEDIES
CONSTANTLY ON HAND

CHEMIST

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cm

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Portia Tuckeriana

Nov 22 '67

North side of Maystun Pond

Oct 23 1867

Wm. B. Smith



$\frac{29.5 - 36}{60} = 0.49 - 0.60 \text{ mm}$

very perfect

markings finely developed.



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PHARMACEUTIST,
No. 100 N. 3rd St.,
St. Louis, Mo.



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GARDEN

J. Fuchsmanni
(mixed with *J. Braunii*)
Wm Booth Myster-pond Aug 6 1865

Dec 13 1866

ex Hb Gray

1 ||||| Diam of spores $\frac{29-37}{60} = 0.48-0.61$



$\frac{12-13.5}{4.5} = 2.9-3.3$ m m

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HERBARIUM

ALEX. TELLER



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Isotria Tuckerianii A. Br.

Oct 29 1866

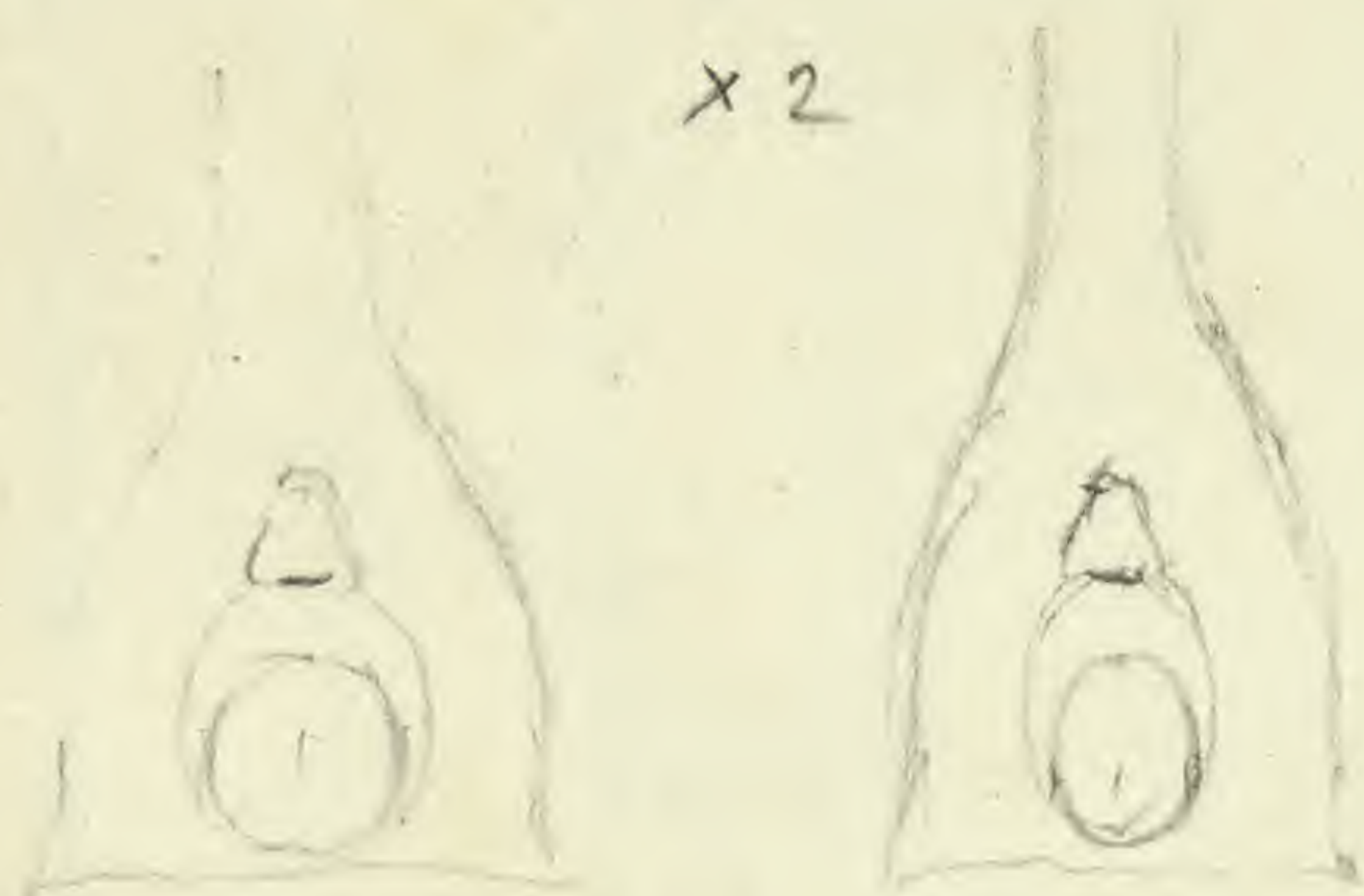
x411



0.029
-0.032 mm long



Diameter of spores x60
 $\frac{28-35}{60} = 0.47-0.56$ mm



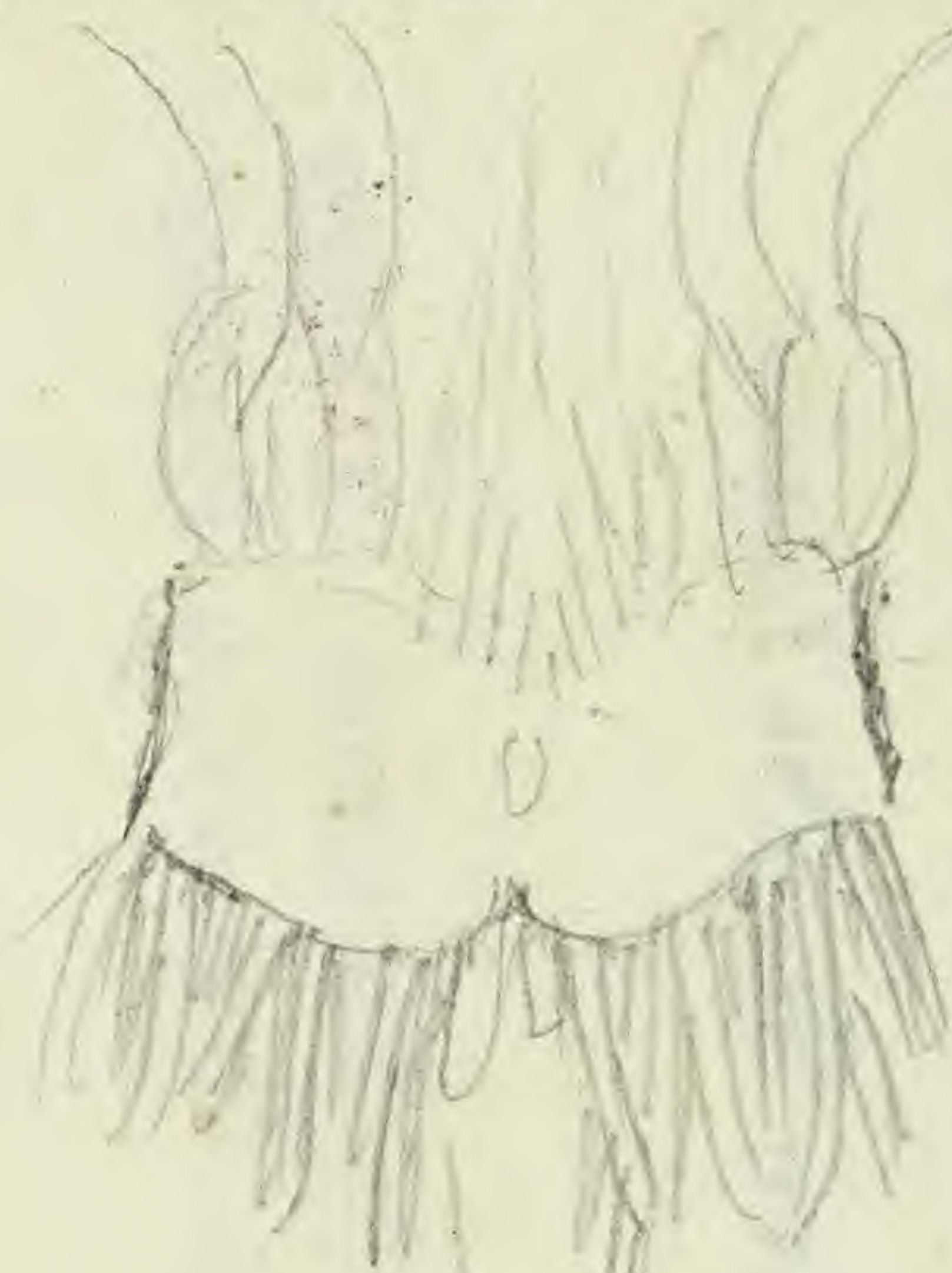
x2

microsporangia

myster Pond

Wm Booth Oct 21

Scat of largest
leaves, 4" long,
only $1\frac{1}{2}$ mm. diam
x10



x2

remnants of old
trunk fallen off
or very loosely
adhering

20-25 leaves 3-4 inches
long
round, brown

very few old spores visible, some micro-
sporangia bearing leaves outside, then sterile
leaves and inside of them leaves with
young macrospores - second (fall) growth



0 1 2 3 4 5 6 7 8 9 10

cm

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cm

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GARDEN

Isotria Tuckerianii A. Br.

Oct 29 1866

x411



0.029
- 0.032 mm long

Myster Pond

Wm Booth Oct 21

Diagram of spores x60
 $\frac{28-35}{60} = 0.47-0.56$ mm

Scat of largest
leaves, 4" long,
only $1\frac{1}{2}$ mm. diam
x10



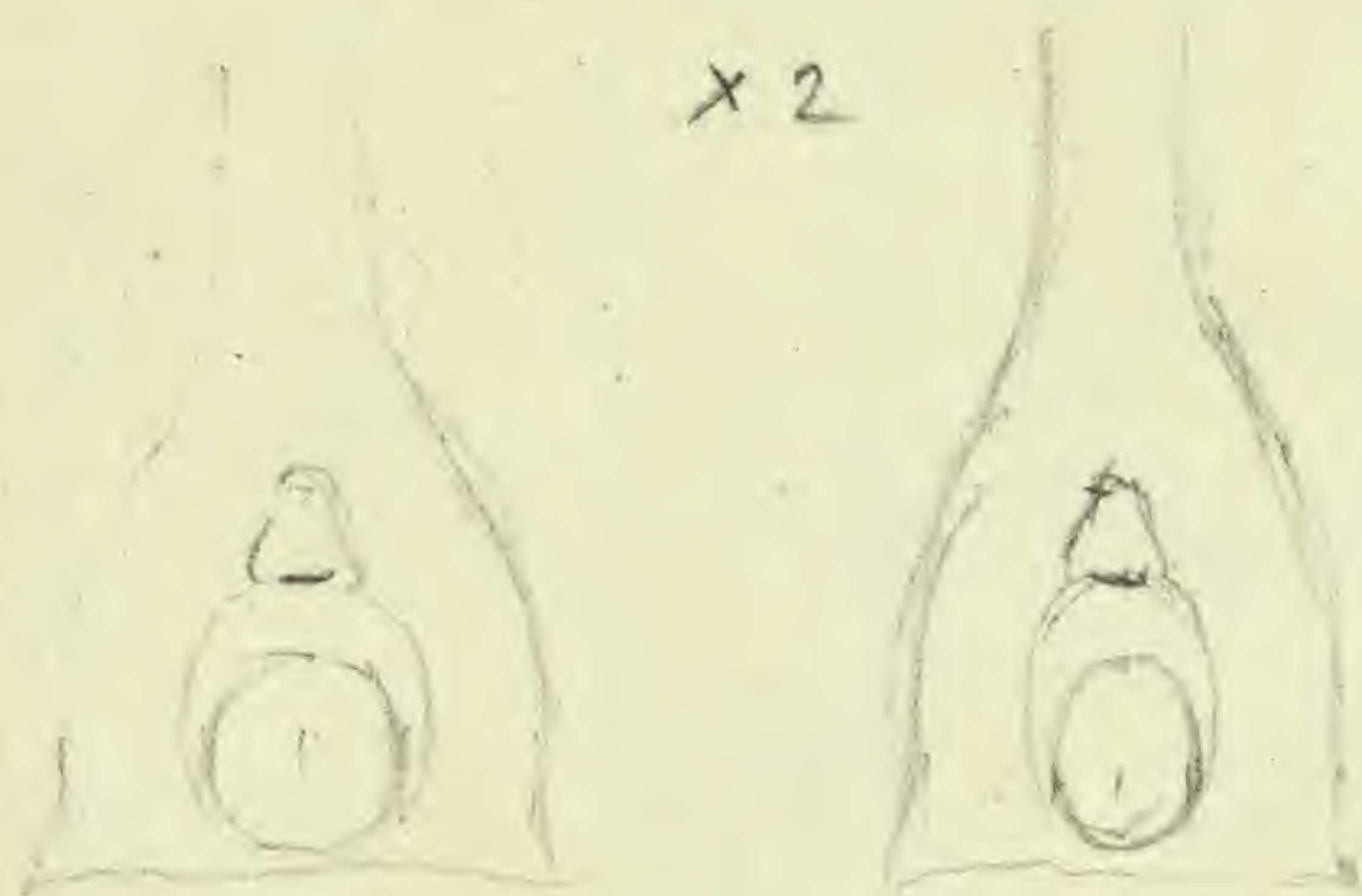
x2

remnants of old
trunk fallen off
or very loosely
adhering

20-25 leaves 3-4 inches

long
recurved, brown

very few old spores visible, some micro-
sporangia bearing leaves outside, then sterile
leaves and inside of the leaves with
young macrospores - second (fall) growth



x2

microsporangia



0 1 2 3 4 5 6 7 8 9 10

cm

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Alex. Leitch,

APOTHECARY & CHEMIST,

Cor. 4th & Olive Sts., St. Louis.

A. Dracum in litt (Febr 1867) classes
J. Tuckermanni with those with stomata
and as to *J. riparia*. In April 1867
I have examined specimens of all my
different localities (excepting *Ac.*, *Myrt.*
pond, *Horn Pond*) and fail to
discover any stomata!

Repeated the same operation May 20th with
same result.

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Isotria Tuckermanni Braun

In Mystic River, very near its
~~exit~~^{issue} from the pond, where a small
bridge crosses the highway.

P. Tuckerman 1848

Tuckerman - C.H. Nov. 27 1866

Aug. 1848 Tuckerm. Label in Hb Gray



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COR. 4TH & OLIVE STS. ST. LOUIS

APOTHECARY & PHARMACEUTIST

ALEX. LEITCH



18629



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& sends to Braun Isoter for Calif (5080. 5091 = 5093) (1866)
 of which pygmaea 6025 - & California, 5091 have been rec^d
 and later the specimens from the Sierra 1870
I. pygmaea has uncommonly short epidermis cells 1-2 rarely 3 times as
 long as wide (— in California 4-6 times as long as wide)
 no stomata — macrospores with distinct rounded, rather pointed ends
 or tubercles ^{rarely united & ridges} in California tubercles elongated wavy, wrinkle-like
 and much flatter or lower — macrospores in pygmaea ^{doubtly shorter} spinulose
 macrospores very unequal ^{in pygmaea} 0.36 - 0.60 even 0.70 ^{in in} (Braun's measures
 in California 0.40 - 0.45 rarely 0.48 ^{in in} are all too large)

I. pygmaea belongs to the *Leucostis* alliance (no 6025)

I. Californica Engelm⁵⁰⁹¹ (or *Dolobris* Engelm) near *ambigua* & *jackmanii*
 larger volume than pygmaea — abundant stomata, easily seen
 by iodine; microspores not seen No. 5080. 5091. 5093. & 1870

macrospores of flaccid Nuttall's *scutellarioides*
 (pygmaea) & California both roughly

California: (5091) very similar in appearance to *echinops*, leaves very delicate,
 gradually ~~distally~~ attenuating — no best bundles, volume $\frac{1}{3}$ - $\frac{1}{2}$ covering spongy
^{macrospores with} ~~macrospores~~ flat undulating but scarcely anastomosing
 ridges

pygmaea (6025) leaves attenuating only at tip. Volume very narrow
 particularly rich in chlorophyll narrower than in California

A Braun & litt. April 13/1867



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St. Louis, Mo.

Oct 8th 1872

Engelman

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18630

5091
40-45-48
26-60 (70)
28-48
38-49



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Isotria Cascades, Oregon, T. S. Pringle 1882 Dec 17 1882

Microspores $\frac{10.5-12}{415} = 0.025-0.029$ mm, smooth
pale gray

Macrospores $\frac{21-25}{60} = 0.36-0.42$ mm diam

with very delicate or faint puncta
and ridges, verruciform rugulae
velum narrow; sporangium spotted

leaves 10-15 2-3 inches
long

stomata!

bast bundles? none
none seen

dissepiments with 4 x 5 cell-
layers

x60



+150



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Isoetes

Jan 23 1874

macrospores of last year
adhering

Mary's Lake, Summit 7000'

H. Bolander

June 1870.

415

$\frac{19.5 - 24.5}{60} = 0.32 - 0.41$
mostly 0.037 mm

microspores of last year
muriculate brown

x60



13.5
0.032 mm
12
0.029 mm
x 415



x30

sect. of
leaf

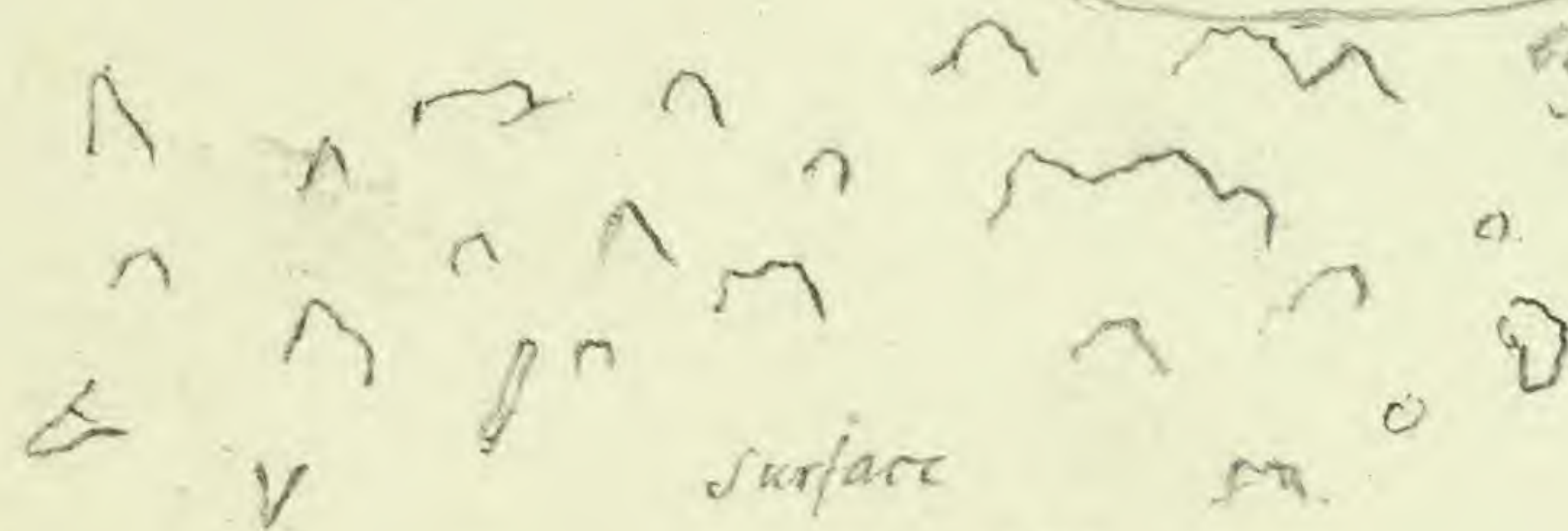


x10



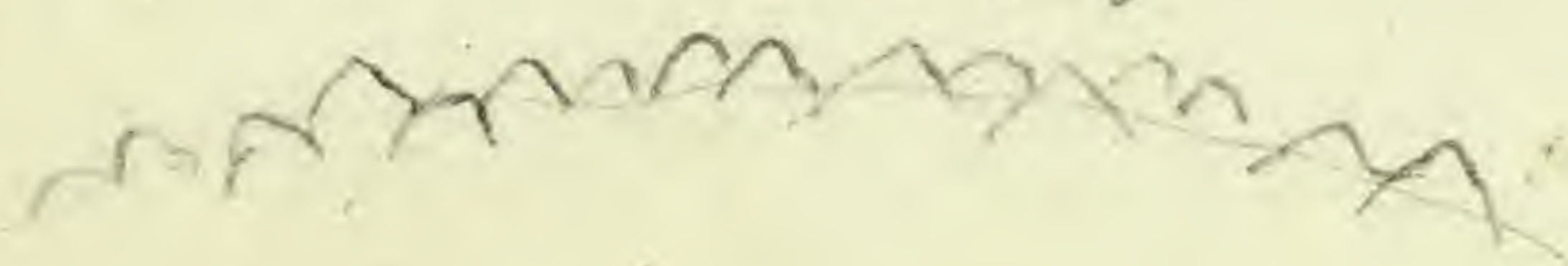
x30

boiled
in alcohol



surface

edge x150



section x2

moulded
dried part

leaves 4-6 inches long
strongly subulate, slender
no leaf bundles or stomata
discovered

epidermis
cells x280



0

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Jan 23, 25 1874

Small Lakes, Cisco, Calif.
Diam. of old spores, found among
the roots

1,500 - 5000 feet alt., June 1870
in deep water, H. Bolander

$$\frac{22-27}{60} = 0.37-45$$

microspores brown 0.028-0.031 2000


 parts on spores
 x150

22 p. 2.

surface
x 150

x60

13

X 415

11 1/2

$$\frac{19.5 - 22}{60} = 0.32$$

full grown but immature spores
of this plant

x 60

smooth or very slightly
warty

x415
immature
microspore

x2

Y 280

Set of Leaf

x 30

no brown cells
of sporangium

Leaves 4-5 inches,
tapering

no bird-bands seen

stomata
no starch now (young)
in stomata cells



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5091. Bolander

Isotria Bolanderi

Jan 25 1874

Little Porto in meadows, upper Tuolumne River, Sept. 1866
9000-10000'

19.5-24, mostly $\frac{22}{60}$

Diameter of macrospores 0.32-0.40
mostly 0.37



ridges and warts on spores $\times 150$
sometimes well marked,
often indistinct or
wanting



Brown microspores $\frac{11.5-12}{1615}$
spinulose 0.028 - 0.031



Leaves 3-6 inches



0 1 2 3 4 5 6 7 8 9 10

cm

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Druggist & **A**pothecary

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G. F. ENGLEMAN, M.D.,
3003 LOCUST STREET.



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5080

Boetes

Jan 25 1874

Mount Dana, 10,000, Bolander 1866

Diameter
macrospores $\frac{18-26}{60}$

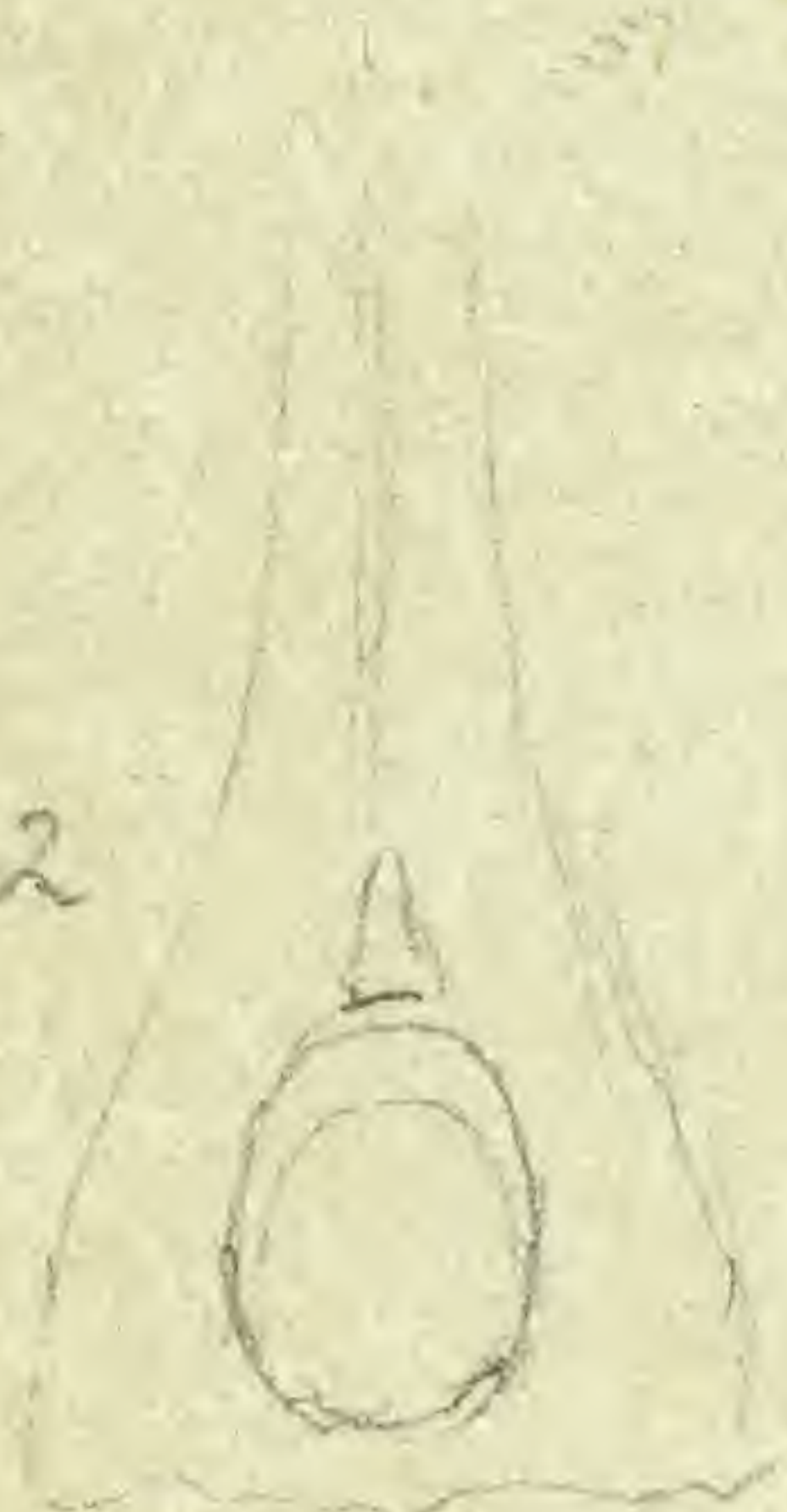
= 0.30-0.43



Surface x 150

15-18 leaves
4" long $\frac{11.5-13}{4.5}$ microspores 0.028-0.031 mm
brown, but scarcely spinulose

x2



0 1 2 3 4 5 6 7 8 9 10

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0 1 2 3 4 5 6 7 8 9 10

cm

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Isotetes Bolanderi

mean 30-48 - 26-32

Jan 25 1874

	macrosp.	microsp.
5091 Indianne, 10,000' alt 1866	0.32-40	0.028-31
5091 Lake Collet "	0.31-37	
5093 Monotrail, 10,000' alt "	0.39-48	0.026-29
5080 Mount Dana, 10,000' "	0.30-43	0.028-31
Small Lakes, Cisco 1870 4500 - 5000' alt	0.37-45	0.028-31
Mary's Lake, summit 1870 7000' alt	0.32-41	0.027-0.032
Toole Lake 7500' alt	0.34-40	0.024-0.028
Mt Adams, Canada	0.32-37	0.022-29
Yellow Stone Lake	0.28-38	0.026-29
Wasatch Mountains	0.28-41	
West Colorado	0.40-47	
Mt Adams	0.32-37	0.027-29
(Pygmy)	0.38-49	0.024-28

California, Bolander

1866 and 1870

G.E.

Sachsberg

J. Parry, 1873

M. Jones 1879

T.S. Brandegee 1881
W.H. Saksberg 1881



0 1 2 3 4 5 6 7 8 9 10

cm

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MISSOURI
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GARDEN

13636

STODDARD PHARMACY,

N. W. Corner Easton and Garrison Ave's.

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Botanical observations in Western Wyoming by Dr. Parry
in *American Naturalist* vol 8. 1874 p. 214

Isotria Bolanderi Engelm. Trunk deeply 2-lobed leaves (5-20, 2-4 1/2 inches long) 4 angled, slender, tapering to a very fine point, bright green, soft; epidermis cells elongated; with stomata, but without peripheral thickening; sporophylls mostly oblong, covered about 1/3 or 1/4 by the ovule, unspotted. Microspores 0.20-0.45 mm diam. beak with minute points and wrinkles; microspores 0.026-0.031 mm long more or less papillose or spinulose, deep brown. - In ponds and shallow lakes on the Sierra Nevada.

Jan 1880. McJannet's plant for Utah shows not "pinnals" but (like all the others) warts or blunts, obtuse tubercles; much more on the lower hemisphere than on the 3 upper segments. These are often almost smooth and even



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5091 Bolander 1866

Isotria

Jan 25 1874

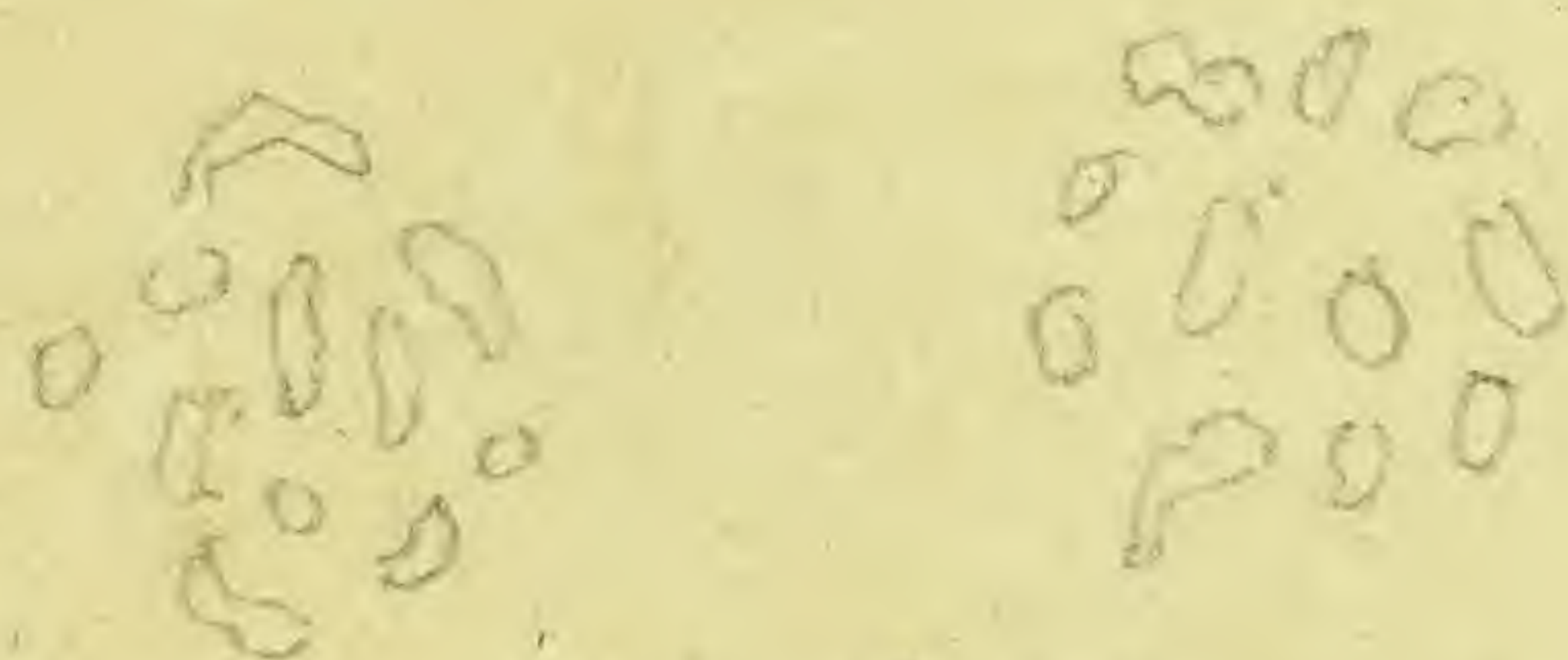
Isle Collection

6-8 leaves, 2-3 inches high



Diam of macrospores $\frac{18.5-22}{60}$ mm

= 0.31 - 0.37 mm



surface
of macrospores x150



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